FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Zaawansowana technika wysokich napięć**
Name in English:	**Advanced High Voltage Technology**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	**Control in Electrical Power Engineering**
Level and form of studies:	**2nd level, full-time**
Kind of subject:	**obligatory**
Subject code:	**ELR051120**
Group of courses:	**NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	30		30		
Number of hours of total student workload (CNPS):	90		60		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	3		2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:	2.10		1.40		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basics of physics and electrostatics
2. Fundamentals of materials engineering

SUBJECT OBJECTIVES

C1. Getting to know the behavior of dielectric materials under the influence of a strong electric field

C2. Acquiring practical skills necessary for the proper assambly of testing and measuring devices, and proper implementation and development of measurement results.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 Can describe and explain phenomena and processes responsible for the behavior of insulating materials under the influence of a strong electric field

PEU_W02 Is able to describe high-voltage insulation systems

relating to skills:

PEU_U01 Knows how to properly perform measurements in high-voltage systems and then develop and interpret results.

PEU_U02 Can use the knowledge gained earlier to describe the mechanism of phenomena.

relating to social competences:

PEU_K01 Awareness of teamwork and responsibility of all members of the team for the execution of the task

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours:**
Lec 1	Electrostatic fundamentals	2
Lec 2	Electrification of solid and liquid materials. Electrostatic hazards. Electrostatic charge elimination techniques	2
Lec 3	Electrostatic precipitation	2
Lec 4	Electrostatic atomization and spraying	2
Lec 5	Electrostatic printing technology and electrophotography	2
Lec 6	Application of electrostatic separation	2
Lec 7	Nonthermal plasma – fundamentals and applications	2
Lec 8	High voltage generation	2
Lec 9	Electric field. Air dielectric strength.	2
Lec 10	The strength of insulating liquids.	2
Lec 11	The strength of solid dielectrics	2
Lec 12	High voltage cables	2
Lec 13	Overvoltages and its reduction	2
Lec 14	Non-destructive diagnostic methods. Overhead high voltage insulation.	2
Lec 15	Test	2
	Total hours:	**30**

Form of classes - laboratory		**Number of hours:**
Lab 1	Introduction, safety work regulations, subject area of the laboratory	3
Lab 2	Measurements of AC high voltage.	3
Lab 3	Test system of DC high voltage.	3
Lab 4	Surface electric strength of the post and bushing insulators under AC 50 Hz high voltage	3
Lab 5	Measurement of dielectric loss factor and partial discharges in the high voltage insulation systems	3
Lab 6	Voltage distribution on the string of disc insulators	3
Lab 7	Wave phenomena in the model long power line	3
Lab 8	Electric strength of insulation systems in the air at the AC high voltage	3
Lab 9	Generation and measurement of impulse high voltage	3
Lab 10	Last term, course acceptance	3
	Total hours:	**30**

TEACHING TOOLS USED
N1. traditional lecture
N2. Laboratory conducted in the traditional manner

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEU_W01 PEU_W02 PEU_K01	Test
P(W)	P=F1	
F1(L)	PEU_U02 PEU_K01	evaluation of preparation for laboratory classes
F2(L)	PEU_U01 PEU_U02 PEU_K01	Evaluation reports
P(L)	P=0.7*F1+0.3*F2	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Kuffel E., Zaengl W.S., Kuffel J., High Voltage Engineering Fundamentals. Newnes, Oxford, 2000
[2] Holtzhausen J.P., Vosloo W.L., High Voltage Engineering, Practice and Theory. Stellenbosch University 2008
[3] R. Arora, W. Mosch; High Voltage Insulation Engineering; New Age International (P) Limited Publischers 2008

SECONDARY LITERATURE:

[1] Ryan M.H., High Voltage Engineering and Testing. Institution of Electrical Engineers, London 2001
[2] IEEE standard 4-1995, IEEE Standard Techniques for High-Voltage Testing
[3] A. Haddad, D. Warne; Advances in High Voltage Engineering, The Institution of Engineering and Technology 2009

SUBJECT SUPERVISOR

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